REMARKS

Prior to the present response, claims 31, 33-34, and 36-40 were pending in the present application and now remain in the present application. Reconsideration and allowance of remaining claims 31, 33-34, and 36-40 in light of the following remarks are respectfully requested.

A. Rejection of Claim 31 Under 35 USC § 102(e)

The Examiner has rejected claim 31 under 35 USC §102(e) as being anticipated by US published application number 2004/0058546 to Hall et al. (hereinafter "Hall"). Independent claim 31 requires that the reduction in dispensing the slurry occurs after detection of an endpoint of the polishing step based on a thickness of the excess interconnect material. As the Examiner has apparently or implicitly acknowledged, Hall has not been cited as disclosing such this step. Hall has been cited to disclose a "process where a high pH polish is conducted on a semiconductor interconnect during planarization and then the slurry dispense is terminated and a second polish is conducted with a rinse solution." Page 2 of the Final Office Action, paragraph 3. Thus, claim 31 is not disclosed or suggested by Hall and, as such, independent claim 31 is patentably distinguishable over Hall. On page 5 of the Final Office Action, the Examiner has stated that "the thickness and endpoint detection is considered to be inherent in the prior art, especially in the process of Singh, where optical sensors are used." Page 5 of the Final Office Action, paragraph 9. However, the requirement of present claim 31, i.e. the

requirement that the reduction in dispensing the slurry occurs after detection of an endpoint of the polishing step based on the thickness of the excess interconnect material, has not been disclosed by Hall and thus Hall is not a proper anticipatory reference under 35 USC §102(e). Moreover, Applicant submits that this requirement, in the context of the claimed invention, is not inherent in the art. The Examiner has not cited any reference explicitly supporting the Examiner's conclusion that the requirement that the reduction in dispensing the slurry occurs after detection of an endpoint of the polishing step based on the thickness of the excess interconnect material is, in the context of the present invention, inherent in the art. Indeed, even Singh has failed to disclose this requirement in the context of the present invention.

B. Rejection of Claims 31 and 35-37 Under 35 USC § 102(e)

The Examiner has rejected claims 31 and 35-37 under 35 USC §102(e) as being anticipated by US published application number 2003/0162399 to Singh (hereinafter "Singh"). The present invention, as defined by independent claim 31 is directed to, among other things, reducing dishing in metal features during CMP process. The present invention, as defined by independent claim 31 requires that, after passage of a first time period, the flow rate of the slurry during a second time period be reduced and in fact be stopped so that during the second time period only a polishing action, with no slurry flow, would occur. As such, independent claim 31 requires "reducing said dispensing of said slurry after said polishing for a first period of time, wherein said dispensing of said slurry

is reduced to a stop" followed by "polishing said sample using said polishing pad for a second period of time to remove said excess interconnect material." Moreover, independent claim 31 now requires the reduction in dispensing the slurry to occur after detection of an endpoint of the polishing step based on a thickness of the excess interconnect material.

In contrast, Singh discloses chemical mechanical polishing of a structure with one or more metal based films and at least one underlying dielectric film with at least one selective adsorption additive, such as a surfactant or a polymer. The metal film does not substantially adsorb the selective adsorption additive surfactant, while dielectric film substantially adsorbs the selective adsorption additive. A number of composite particles are added, such as inorganic cores surrounded by the selective adsorption additive. Singh also discloses a method for polishing a metal film and an underlying dielectric film including polishing during a first time interval using a first slurry composition and polishing during a second time interval with a second slurry composition, wherein a selectivity ratio for metal/dielectric polishing using the first slurry composition to the metal/dielectric selectivity using the second slurry composition is fixed.

However, Singh does not disclose stopping the flow rate of the slurry after passage of a first time period, and performing only a polishing action, with no slurry flow. Further, Singh does not disclose that the reduction in dispensing the slurry occurs after detection of an endpoint of the polishing step based on a thickness of the excess interconnect material.

The Examiner has pointed to paragraph 0143 of Singh as disclosing that the Singh method is "selective to the metal materials using optical sensors (which inherently takes into consideration the endpoint detection and thickness of the interconnect materials)." Page 4 of the present Office Action, lines 4-6.

However, paragraph 0143 of Singh states in its entirety:

> "FIG. 9 shows an apparatus 900 designed to feed the interval and continuous slurry for metal polishing. Mixing of the interval slurry 902 and continuous slurry 904 can take place in a mixing tank 910 before being supplied to the CMP tool. Alternatively, the continuous and interval slurries can be mixed on the polishing tool at the point of use (on polishing pad 920). *An optical or a frictional based sensor (not shown) can be used to monitor the surface condition of the wafer.* Other types of sensing mechanisms based on acoustic, vibration and other techniques can also be used. The interval slurry is typically added when the metal overlayer has been substantially removed from the surface. The apparatus can be used to polish a wide variety of electrically conducting materials including, refractory materials and noble metals, as well as related electrically conducting compounds and mixtures." Page 13 of Singh, paragraph 0143 (emphasis added).

In contrast, the invention discloses and claims that the reduction in dispensing the slurry occurs after detection of an endpoint of the polishing step based on a thickness of the excess interconnect material. None of these elements is disclosed by paragraph 0143 of Singh: Singh merely suggests that "[a]n optical or a frictional based sensor" be used to monitor the surface condition of the wafer and not the thickness of material. Furthermore, Singh does not perform such sensing to detect an endpoint of the polishing step or to reduce the dispensing of the slurry. As such, Singh does not disclose or suggest the invention claimed by independent claim 31. Thus, dependent claims 36-37 are also patentably distinguishable over Singh for at least the reasons discussed above and for added limitations of each dependent claim.

C. Rejection of Claims 33-34 and 38 Under 35 USC § 103(a)

The Examiner has rejected claim 31 under 35 USC §102(e) as being unpatentable over Singh in view of U.S. Patent No. 5,441,598 to Yu (hereinafter "Yu"). As discussed above, independent claim 31 is patentably distinguishable over Singh. Thus, dependent claims 34 and 38 are also patentably distinguishable over Singh, or any combination of Singh and Yu, for at least the reasons discussed above and for added limitations of each dependent claim.

D. **Conclusion**

For all the foregoing reasons, Applicant respectfully submits that independent claim 31 its dependent claims 33-34 and 36-40 are patentable over the art of record and as such withdrawal of the present final rejection and an early notice of allowance directed to claims 31, 33-34, and 36-40 remaining in the present application are respectfully requested.

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Respectfully Submitted,
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